

**M E M O R A N D U M**

TO: Low Income Consumer Advisory Task Force

FROM: Liz Jambor, EdD, Manager

DATE: 01/09/2015

SUBJECT: Data Analysis on Impact of HVAC and Refrigerator Installs in AE Low Income Weatherization Program

The Low Income Consumer Advisory Task Force asked AE to assess the impact of HVAC and refrigerator installation on the energy savings in the low income weatherization program. The tables below provide that information.

Table 1 provides data from the Weatherization Assistance Program (WAP), participants funded through the ARRA grant. This table provides information for dwellings that were part of the weatherization program and include all participants despite consistent residency throughout the 2 years of data collection. In other words, usage could be impacted by the differences in people and not structures. As you will see, there is no consistent savings across dwelling types and between equipment changes. The average savings across all participants is \$57.01 annually, or just under \$5 per month. The average savings for participants experiencing weatherization only was 697 kWh; for HVAC, 911 kWh; for refrigerators, 150 kWh; and for both HVAC and refrigerators, 640 kWh. For the additional expense for an HVAC or refrigerator, the savings is no more than 214 kWh annually or \$21 per year.

Table 2 provides data from the WAP program similar to Table 1, but contains only the data for consistent residency. This data accounts for people-related impacts in usage because the people factor is consistent over the time frame of data analysis. As you will see, there is no consistent savings across dwelling types and between equipment changes. The average savings across all weatherization was pennies higher at \$57.30 annually, again just under \$5 per month. The average savings for dwellings experiencing weatherization only was 401 kWh; for HVAC, 727 kWh; for refrigerators, 448 kWh; and for both HVAC and refrigerators, 1391 kWh. For the additional expense for an HVAC or refrigerator, the savings is no more than 326 kWh annually or \$33 per year.

The higher rate of savings in the consistent all dwellings as compared to the consistent resident dwelling occupancy supports the idea of awareness of and education about the weatherization improvements and energy use could be a beneficial tool to prevent substantial snap back where savings are sacrificed to changes in behavior.

Across all groups, the savings for those with weatherization and a refrigerator replacement was the lowest. There was nothing in the data to support refrigerator replacements as a viable energy saving method.

HVAC replacements savings was highest in the multifamily properties than in the single family. This is most likely due to the replacement of strip heating with heat pumps. Data indicates that winter use of strip heating can lead to higher energy consumption than summer air conditioning use. Replacement of strip heating can provide energy savings not seen with only air conditioner replacement.

The tables also provide the return on investment as well as the ROI years beyond the life of the equipment. For all but two of the improvement categories, the time to meet the return on investment was much greater than the expected life of the equipment. In other words, we are paying for the upgrades for longer than the equipment is expected to last.

The data provided here indicates that universal HVAC and refrigerator replacement will not reduce the energy costs for customers. It also shows that universal replacements are costly with ROI terms longer than equipment life. Finally, awareness and education of the energy efficiency improvements should be part of any energy efficiency process.



MEMORANDUM

TABLE 1. Multiple Residents Over 2-Year Period

Owner Occupied for 2 years	Dwelling Type	AC	Fridge	Number of Dwellings	Mean Annual Energy Savings (kWh)	Mean Peak Reduction (kW)	Mean Actual Job Cost	Average Annual Cost Savings (\$0.10 per kWh)	ROI (years)	Product Life	Years Beyond Product Life
No	SF			233	643	0.27	\$ 2,864	\$ 64	45	NA	NA
No	SF		X	72	1412	0.49	\$ 2,897	\$ 141	21	10	11
No	SF	X		164	31	0.19	\$ 4,794	\$ 3	1536	15	1521
No	SF	X	X	35	547	0.32	\$ 4,653	\$ 55	85	15	70
No	Duplex			16	1012	0.19	\$ 2,091	\$ 101	21	NA	NA
No	Duplex		X	29	381	0.19	\$ 1,780	\$ 38	47	10	37
No	Duplex	X		22	357	0.27	\$ 4,208	\$ 36	118	15	103
No	Duplex	X	X	16	612	0.22	\$ 3,789	\$ 61	62	15	47
No	MF			58	1029	0.37	\$ 2,986	\$ 103	29	NA	NA
No	MF		X	18	-235	None	\$ 2,171	\$ (23)	NA	NA	NA
No	MF	X		9	2402	0.84	\$ 4,535	\$ 240	19	15	4
No	MF	X	X	7	1228	0.62	\$ 4,418	\$ 123	36	15	21
AVERAGE					570.13	0.28	\$ 3,446	\$ 57	60.44	15	45.44

TABLE 2. Single Resident Over 2-Year Period

Owner Occupied for 2 years	Dwelling Type	AC	Fridge	Number of Dwellings	Mean Annual Energy Savings (kWh)	Mean Peak Reduction (kW)	Mean Actual Job Cost	Average Annual Cost Savings (\$0.10 per kWh)	ROI (years)	Product Life	Years Beyond Product Life
Yes	SF			51	316	0.08	\$ 2,898	\$ 32	92	NA	
Yes	SF		X	15	1416	0.68	\$ 3,072	\$ 142	22	10	12
Yes	SF	X		18	-784	None	\$ 4,724	\$ (78)	NA	15	
Yes	SF	X	X	6	3080	1.01	\$ 4,457	\$ 308	14	15	-1
Yes	Duplex			5	1315	0.09	\$ 1,754	\$ 131	13	NA	NA
Yes	Duplex		X	16	467	0.19	\$ 1,976	\$ 47	42	10	32
Yes	Duplex	X		9	890	0.26	\$ 3,952	\$ 89	44	15	29
Yes	Duplex	X	X	9	382	0.11	\$ 3,350	\$ 38	88	15	73
Yes	MF			33	517	0.31	\$ 2,986	\$ 52	58	NA	NA
Yes	MF		X	9	44	0.21	\$ 2,523	\$ 4	578	10	568
Yes	MF	X		5	4067	1.22	\$ 4,950	\$ 407	12	15	-3
Yes	MF	X	X	2	869	0.25	\$ 4,476	\$ 87	51	15	36
AVERAGE					572.97	0.23	\$ 3,170	\$ 57	55.33	15	40.33